Warm Water Ponds For FISHING

FARMERS' BULLETIN 2210
U.S. DEPARTMENT OF AGRICULTURE

A FISHPOND is a delightful part of a farm or ranch. It adds beauty to the land and provides recreation for farmers, ranchers, and their friends and for paying guests. On a suitable site a pond makes good use of the land and the impounded water has many uses.

Fishponds are profitable when they are managed well. To produce the most income and recreation, they must afford good fishing. Most disappointments result from mistakes in construction, stocking, and management.

This bulletin is specific only for "warm-water" ponds—not for "cool-water" or "cold-water" ponds. It points out the importance of site, erosion control, proper stocking, adequate fertility, and weed control. It explains how to manage a warm-water pond for profitable fishing. By following these guides, you can be assured of a lasting pond that can be fished many times a year.

This bulletin supersedes Farmers' Bulletin 2094, "Managing Farm Fishponds for Bass and Bluegills."

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A pond that provides good fishing is a profitable and pleasant feature of a farm or ranch. Any pond intended primarily for fishing also may provide related recreation benefits—boating, swimming, picnicking, and water for wildlife.

Most ponds will produce some fishing. They will produce more if they are built correctly and managed right.

Management requires more than the building, stocking, and fishing of a pond. Fish production is influenced by the natural qualities of the water including: (1) Temperature, (2) oxygen, (3) fertility, (4) acidity and alkalinity, (5) waterweeds, (6) muddiness, and (7) the amount of water that flows through a pond. The Soil Conservation Service specialist in your locality is experienced in the techniques of soil, water, and plant management and engineering design. He can advise you how to build and manage your pond.

Ponds yield the best fishing if they are built and managed primarily for fish production and fishing. This recreation use of a pond can be profitable to the owner. His investment and management costs can be returned in the following ways:

(1) Recreation and food for himself, his family, and friends.

(2) Sale of fishing rights to a club or group for an annual fee or sale of fishing privileges to individuals by daily or annual charges. The owner should have 15 or more acres in fishponds if the sale of fishing privileges is to be a dependable income source.

Ponds that are built for other uses can provide good fishing but usually are less productive than those built and managed primarily for fish.

Selecting the Site

Many farms and ranches have sites for fishponds. Four things are important in selecting a good site:

Size of the pond. If the pond is to be stocked with bass and bluegill, it should cover an acre or more. Smaller ponds support some bass and bluegill but seldom produce enough for good weekly catches. They may have to be restocked occasionally. Channel catfish or bait minnows would be more satisfactory in such small ponds.

Temperature of the pond water. Most *warm-water ponds* reach spring temperatures of 50° to 70° F. and summer temperatures of 80° to 90° F. or higher (measured 6 to 12 inches under the surface of the water).

Cool-water ponds are a little too warm for trout and a little too cold for warm-water fish. A *cool-water pond* is one in which summer temperatures rise to 70° and seldom above 80° F. Such ponds are common in the North. There isn't much you can do to make a pond colder; but some can be improved for warm-water fish by routing incoming cold water along the bottom to flow out through a trickle tube and drainpipe (see drawings, p. 5). Since warm water is lighter than cold water, it stays on top.

Cold-water ponds are not satisfactory for warm-water fish such as largemouth bass and bluegill and redear sunfish. A *cold-water pond* is one in which summer temperatures seldom rise above 70° F. Rainbow or brook trout are suited to such cold waters. If you have a cold-water pond, get a copy of Farmers' Bulletin 2154, "Trout in Farm and Ranch Ponds," from your

county agent or Soil Conservation Service office.

RELIABLE WATER SUPPLY. A good fishpond must have a satisfactory water supply—enough spring flow, well water, or silt-free runoff to fill the pond in a year or less and to replenish the water lost by seepage and evaporation.

SUITABLE SITE FOR IMPOUNDING WATER. In the South, a water depth of 3 to 4 feet is sufficient if the water level can be kept constant. Deeper water is satisfactory but will produce no more fish. To protect fish from winterkills, ponds in the Central States should be 6 to 8 feet deep and as deep as 18 feet in the North.

Before you build a pond, make sure your soil will hold water. The soil must be suitable for the pond bottom as well as for the dam. Your local soil conservationist will help you select a suitable site.

Building the Pond

A good fishpond must be properly located, designed, and constructed. You should seek assistance from the Soil Conservation Service (SCS) through your soil conservation district or from an experienced private engineer. There are several aspects of fishpond construction that require special attention.

The top width of the dam should be at least 10 feet. This makes the dam safe from serious damage by muskrats that may burrow into it. It also provides a roadway for crossing.

Shallow water at the edges is troublesome because weeds grow here and protect little fish from the bass. A pond is easier to manage if it has no shallow water. Either deepening or filling eliminates shallow edges, but usually a combination of the two is best. A minimum depth of 2 feet is good, but 3 feet is better.

The spillway for keeping floodwater from going over the dam needs to be wide enough to keep its flow shallow so big fish can't swim out. Don't screen the flow to trap the fish. The screen will trap trash as well as fish and end the usefulness of the spillway. The thousands of little fish that will escape even in shallow flows will be replaced by reproduction.

Wild fish sometimes enter ponds by swimming up the spillway from the

GA–R1–776

Deepening shallow edges helps prevent waterweeds.

GA–D4–143

Clearing a strip 20 to 30 feet around the pond provides a grassy bank to fish from.

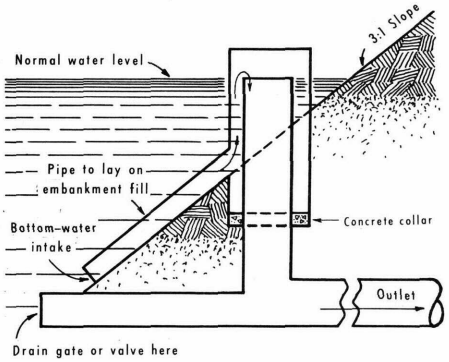
creek below. Where a concrete spillway is used, a 24- to 36-inch vertical overfall in or below the spillway prevents this.

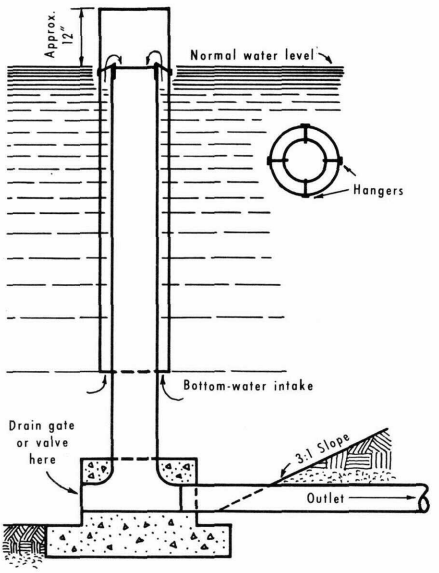
Trees and brush should be removed from the area to be covered with water. If possible, the stumps and snags should also be removed from the pond bottom. This leaves the bottom smooth for seining, which may be required in management.

Clearing of trees and brush from a strip 20 to 30 feet back from the pond edge provides a grassy bank from which to fish. A cleared strip also reduces the quantity of tree leaves that can fall into the pond. Leaves encourage filamentous algae and their decay may cause oxygen depletion in the water.

A drainpipe is useful and is required by law in many States. It should be large enough to drain the pond in 10 to 15 days.

An overflow pipe or trickle tube, connected to the drainpipe, fixes the nor-





Designs for bottom-water overflow. Top of riser must be open.

mal water level a few inches below the emergency spillway. This reduces erosion and drowning of grass cover in the spillway. It also avoids excessive loss of fingerling fish when the pond is first stocked. A device to take overflow from the bottom rather than the top may save fertilizer and also permit you to fertilize your pond early in the spring when the flow is heaviest.

Excavating soil from below the waterline (except for the flood spillway) or from a carefully selected "borrow pit" leaves the pond area attractive.

Stocking With Fish

A fishpond should be stocked with the right kinds and numbers of fish for the kind of water you have and the management you plan to follow. Warm-water ponds are excellent for largemouth bass, bluegill and redear sunfish, catfish, Israeli carp, and bait minnows. Certain types of management make them satisfactory for crappie. Ask your soil conservationist where to get fish for your pond.

Warning: You cannot stock a fishpond successfully if wild fish are present. Before stocking with hatchery fish, kill all wild fish. Use 3 pounds of powder or 3 pints of liquid containing 5 percent rotenone for each acre-foot of water. *Double* these amounts in *cold* weather to be sure of killing green sunfish and bullheads. The best time to use rotenone is at the end of the spawning season—late September or early October. Most States have laws that govern the use of rotenone. Therefore, you may need a permit from your State fish and wildlife agency.

It may be impossible to kill all the wild fish in spring heads, marsh areas, and the like. In such places, do not impound any water until it is too cool for spawning—usually October.

Don't stock any wild fish. They may upset the stocking ratio by spawning before hatchery fish arrive. You also are likely to introduce disease or parasites into your pond.

Bass and bluegill

Most warm-water ponds are stocked with largemouth bass and bluegill (a sunfish), or a combination of bluegill and redear sunfish with the largemouth bass. (The name "bream" is often used for bluegill and other sunfish; many people prefer the name "shellcracker" instead of redear.) These species reproduce regularly and fishing is usually good unless mismanagement or an accidental fish kill upsets the population. Unfortunately, many fishponds become overpopulated with intermediate-size sunfish. Some people, therefore, feel that good fishing year after year is not possible with the bass-bluegill or redear combination. The fact is that thousands of ponds with this combination have been successfully fished for many years with regular and proper management. Overpopulation results from muddy water, faulty management, incorrect stocking, or unusual mishaps such as too much floodwater or a fish kill by insecticides.

The stocking rates established by fishpond research for southern ponds in the early 1940's are still satisfactory: 50 bass and 500 bluegill per acre for ponds of average natural fertility; and from 100 to 150 bass per acre with 1,000 to 1,500 bluegill in waters that will be maintained at high-fertility levels. *It is a serious mistake* and a waste of hatchery fish to *stock at the higher rate if you do not fertilize the pond adequately year after year.*

If water is running through the spillway when you stock, place a temporary screen across the flow for 10 days, *and no longer.* This will prevent the newly stocked fingerlings from leaving the pond before they get settled in their new home. *Then remove the screen.*

Channel catfish

Channel catfish can be grown successfully in warm-water fishponds. They do best when they are the principal fish stocked. (Blue catfish can also be grown in ponds and may prove as desirable as channel catfish.)

The following specifications are for stocking, feeding, and managing channel catfish in ponds that are to be maintained and fished for about 2 years:

(1) Stock channel catfish in ponds that are well protected from floodwater since catfish easily escape through trickle tube or spillway flows.

(2) Stock from 1,500 to 2,000 channel catfish (at least 4 to 5 inches long) and 1,000 fathead minnows per acre in early spring. Add 100 bass fingerlings per acre as soon as the new hatch is available (usually May). The bass are needed to control any wild fish that get into the pond; they also control tadpoles and crawfish and add to the fishing.

(3) Begin feeding a pelleted fish food to the catfish as soon as stocked, continuing through November. Stop feeding when the water is cold and feed again when the water warms up in the spring. You can expect a total yield per acre of 1,200 to 1,300 pounds of catfish and 20 to 40 pounds of bass by fishing, plus about 300 pounds of these fish when you drain the pond. You should drain the pond and start over when most of the original catfish are caught or fishing becomes poor. Channel catfish reproduce sparingly and few fry escape bass predation.

(4) When pelleted fish food is used, you do not need fertilization except for two or three applications during February and March of the first year.

(5) If fish are stocked in February or March, feed about these amounts of pelleted fish food per acre each day: February, 2 pounds; March, 5 pounds; April and May, 10 pounds; June and July, 15 pounds; August and September, 20 pounds; October and November, 25 pounds; December and January, nothing.

From March through September of the second year, feed 10 pounds per day, depending on pounds of fish left in pond.

(6) Begin fishing when the channel catfish are large enough to use. This usually is August or September of the first year, when they reach an average weight of 10 to 12 ounces.

A 1-year pond stocked with channel catfish in early spring and harvested in less than 12 months is the best way to produce a profitable catfish crop for selling wholesale to fish markets. Stock large yearlings at least 6 to 10 inches long to produce larger fish in one growing season. Size can be regulated by rate of stocking. Feed as specified above.

Bullhead catfish

Bullhead catfish spawn readily in bass-bluegill ponds but cannot be grown successfully with bass unless heavy weed growth and extremely shallow water protect them. If bullheads happen to get into a well-managed bass-bluegill pond, they disappear in about 3 years—adults have been caught or have died by then and bass will have eaten the fingerlings. If there is heavy weed growth or shallow water to protect fingerlings, the pond usually becomes overcrowded with small bullhead catfish. Bullhead catfish are squaretailed, whereas channel and blue catfish are forktailed.

Israeli carp

In some southern warm-water ponds, Israeli carp are used to control branched filament and other filamentous algae. Stocking rate is 25 to 50 per acre. Carp fingerlings should be at least 5 inches long where adult bass are present since bass will eat smaller carp. The carp do not spawn successfully in farm fishponds with bass and bluegill present. Israeli carp, an acceptable food to some, grows very fast. (In some States, the fish and game agency prohibits or regulates the stocking of carp.)

Crappie

Though an excellent sport fish, crappie cannot be managed successfully in ponds with uniform water levels all the year. Crappie usually overstock such ponds with useless 1- or 2-ounce fish, reduce the bass supply, and there-

SC–D27–19

Sites not suited to farming often make good fishponds.

by upset the balance between the largemouth bass and bluegill. Crappie are successful, however, in large irrigation reservoirs or lakes that fluctuate significantly in area. Such impoundments have a low water level and small surface area in summer and fall, then expand in the winter and spring to a higher water level that has much more surface area. The summer restriction limits the crappie population; then the added food supply available in the spring allows the survivors to grow rapidly to a usable size. A stocking of about 25 crappie per acre is sufficient. Largemouth bass, 50 to 100 per acre, must also be present in the ponds and lakes where crappie are successful.

Bait fish

Ponds for the production of bait fish are not designed and managed the same as those for fishing. Your soil conservationist can help you plan construction and water management.

Water Quality—How To Improve and Maintain It

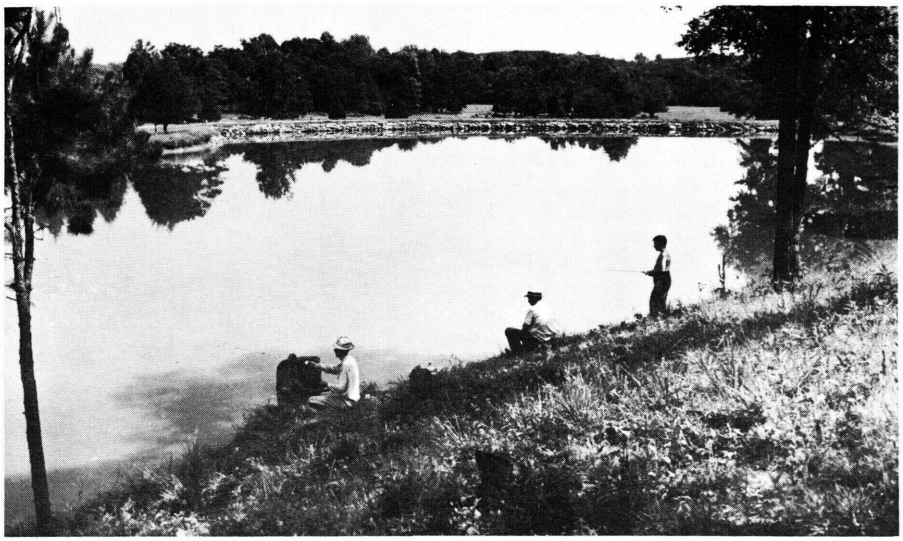
The amount of bass and bluegill fishing that a pond can produce and support is governed mostly by the quality of its water. If you select a favorable site, properly build the pond, and stock it with the right numbers and kinds of fish, the kind of management you practice year after year will determine whether the annual fishing yield is low (15 to 35 pounds per acre), medium (50 to 75), or high (100 to 250).

Muddy water, silt, floodwater

Muddy water reduces fish production. Silt fills a pond. Floodwater replaces fertilized water and may carry the usable-size fish out through the spillway. Thus the life of your pond depends significantly on whether the land above it is protected from soil erosion. A good plant cover on the entire watershed holds the soil in place. It also reduces runoff by allowing more of the rain to soak into the soil.

The work and expense of building the pond, stocking it with fish, and managing it will be wasted unless the watershed is protected.

The SCS conservationist in your district may suggest a diversion ditch or dike to carry water around your pond where erosion and runoff cannot be controlled.



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The site opposite is now a fishpond.

Whether or not to fence livestock away from your pond is a question you must answer. Grazing animals help control weeds and grass along the pond's edge. On the other hand, fencing provides better sanitation, less muddying of the water, and protection for the pond edges. If livestock muddy the whole pond by wading, you must fence them out in order to successfully fertilize.

Some ponds stay muddy for a year or more after construction. Disturbance of some soils causes very small silt particles to remain suspended in the water. Ponds with this kind of muddiness can be cleared by broadcasting 50 pounds of superphosphate and 100 pounds of cottonseed meal per surface acre. You may double these amounts if the pond is extra muddy. This is best done in the spring or fall as heavy applications of cottonseed meal may lead to an oxygen deficiency during the hot summer months. If silt is coming from the watershed, this erosion must be controlled first.

Gypsum also clears muddy ponds. Use 12 pounds of gypsum per 1,000 cubic feet of water (500 pounds per acre-foot of water). This is not harmful to fish or livestock and it leaves the water safe for filtered use in the household. Ponds usually will clear up in a week or two after treatment. Gypsum *does not* add fertility to the water of a pond.

Another way to clear muddy water is to scatter hay in pond edges. Ask your soil conservationist.

Fertility

The fertility level of pond water influences the total poundage of fish produced. Low fertility means low poundage; high fertility assures higher poundage. Natural waters usually have low or moderate fertility. Profitable ponds usually need applications of commercial fertilizer and, once started, a fertilizing program should be continued.

Fishing waters need enough nitrogen, phosphate, and potash to grow vast numbers of microscopic plants. The microscopic plants use the fertilizer in the water and grow and multiply. Fish do not eat the fertilizer, and most of them don't eat the tiny plants to any extent. But they do eat the worms, insect larvae, and other small aquatic animals that feed on these tiny plants.

It takes 4 to 5 pounds of these aquatic

animals to produce a pound of bluegill or redear and in turn 4 to 5 pounds of these little sunfish to grow each pound of bass. Thus the high production of microscopic plants in fertile water results in more pounds of fish.

A naturally fertile pond in the South may support 400 pounds or more of bass and sunfish per acre and yield 150 to 250 pounds annually to fishermen. But the usual pond of natural fertility supports about 150 pounds of bass and sunfish and annually yields only 15 to 35 pounds of usable fish per acre. Your pond is exceptional if it needs no added fertilizer.

High fertility also prevents the growth of submersed waterweeds. With sufficient fertilizer, millions of microscopic plants can be grown. These plants color the water enough to prevent sunlight from reaching the pond bottom at depths of 18 inches or more. The submersed waterweeds cannot grow without sunlight. Further, without weeds to harbor them, mosquito larvae are eaten by the bluegill and bass. Your comfort and the public's health are protected by adequate fertilization.

WHEN TO FERTILIZE. The growing season of the microscopic plants—early spring until late fall—is the time to fertilize. You need to build up your pond's fertility quickly and as early as you can in the spring. Otherwise, you fail to benefit fully from the microscopic plants' growing season. Bluegill make most of their growth before and after spawning. They grow little, if at all, during the long summer spawning season.

In Florida and the southern sections of South Carolina, Georgia, and the Gulf States, you can fertilize the year round. A little farther north the growing season begins in early February. In North Carolina, Tennessee, Missouri, Arkansas, and Oklahoma, you usually find spring weather warm enough for fertilization in early March. In these States warm weather extends into October or November.

New ponds should be fertilized before the hatchery fish arrive. You want to grow a lot of aquatic-animal food for the fish while the weather is warm. You also need to *prevent* the start of waterweeds. Thus, you should begin to fertilize as soon as your pond begins to fill—in spring, summer, or early fall.

GA–W–5

Fertilizers increase fish production: 40 pounds of 20–20–5 or 100 pounds of 8–8–2 is correct for one surface acre.

KIND OF FERTILIZER. A mineral fertilizer is best for fishponds. Organic fertilizers, such as cottonseed meal, blood meal, manure, and leaves encourage undesirable filamentous algae (sometimes called "pond scum"). A satisfactory analysis is 8 pounds of nitrogen, 8 pounds of phosphate, and 2 pounds of potash per hundred pounds of fertilizer. This is known in the trade as 8–8–2 (a ratio of 4:4:1). You may use a stronger fertilizer, such as 16–16–4 or 20–20–5. Just use a smaller amount of it and be sure it has as much nitrogen as phosphate. If you use a mixed fertilizer that has less nitrogen, add enough nitrogen to equal the phosphate.

It may not be necessary to use phosphate and potash in a fishpond that is located in soils high in phosphate. Use only nitrogen and apply it at a rate of 8 pounds per surface acre.

HOW MUCH FERTILIZER. Most ponds require from 6 to 12 applications of fertilizer each year. Those that have little natural fertility or constant run-

ning water may need 12 to 16. A pond that requires as few as 2 or 3 is unusual.

A few naturally fertile ponds do not need added fertilizer.

No one can predict exactly how much fertilizer a pond will require. Ponds need less in dry years and more when rains dilute the fertile waters. You can fertilize any pond correctly by testing the water with a simple gadget you can make yourself.

Nail a white disk on the end of a stick. Mark the stick at 12 and 18 inches above the disk. Your pond is fertile enough to feed 300 to 400 pounds of bass and bluegill per acre when the disk goes out of sight about 12 inches below the surface. If you can see it at a depth of 18 inches or more, you need to fertilize. The color of the water may be any shade of green or brown. Color depends on the number and kinds of microscopic plants.

At each application, use at least 100 pounds of 8–8–2 fertilizer per surface acre but not more than 200 pounds, or use 50 pounds of 16–16–4 or 40 pounds of 20–20–5 per surface acre. Each

GA–D19–28 ; TENN–D29–1

Apply fertilizer from a boat (top) or place it on a floating platform (bottom).

TEX–49,668

A testing stick helps you fertilize correctly.

provides 8 pounds of nitrogen, 8 pounds of phosphate, and 2 pounds of potassium per acre. You will see benefits with your measuring disk within 3 to 7 days. In the spring you can expect to fertilize three to six times at about 10-day intervals. When the color of the water satisfies the test, your pond is fertile enough. Watch it. Test it with your white disk. When it begins to clear, add fertilizer to restore the correct color.

In many ponds—not all—that have been properly and adequately fertilized for 3 to 5 years, the fertility level can be maintained thereafter with applications of phosphate alone. Use 40 pounds of superphosphate or 18 pounds of triple superphosphate per acre at each application. This reduces considerably the cost of pond fertilization. Do this on a trial basis only—if your pond does not respond to the phosphate alone, go back to a complete fertilizer.

HOW TO APPLY FERTILIZER. The easiest way to fertilize is from a platform. First, place a platform about 12 inches below the pond surface at a convenient place near the pond edge. (If your pond level fluctuates, you can use a platform suspended beneath floats.) Then as often as the white disk shows the need, place sacks of fertilizer on the platform and slit them open. Wave action and water currents will mix the fertilizer throughout the pond. One platform is enough for 15 acres of pond surface.

You can also pour the fertilizer from a boat or broadcast it by hand from the bank. You need not scatter the fertilizer over all the pond. In fact, it is better to place it in water no deeper than 3 feet. A single band up one side of the pond and down the other is sufficient.

Waterweeds

Waterweeds are undesirable in fishponds. They use up the pond's fertility, interfere with fishing, do not provide food for sport fish, and may give fish an unpleasant flavor. As they die and decay, weeds create a low-oxygen condition in the water and may cause the death of fish.

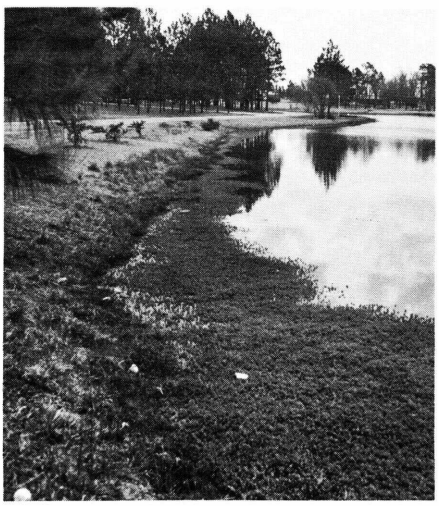
You can prevent most waterweeds from coming into your pond easier than you can get rid of them. Chemical poisons and manual removal are only temporary measures, and they are expensive and hard work. The weeds will return unless you make conditions unfavorable for their growth by having deep edges and highly fertile water. These two measures used together are the chief and cheapest means of preventing most waterweeds. USDA Farmers' Bulletin No. 2181, "Waterweed Control on Farms and Ranches," contains detailed information on avoiding aquatic plants or killing them.

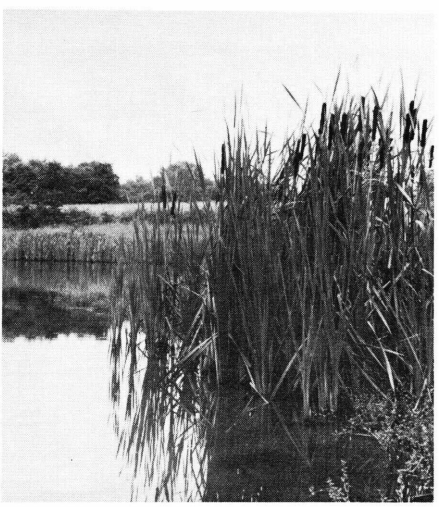
Acidity

Acid waters (low pH) do not respond well to fertilization and therefore produce poor crops of fish. A pH of 4.0 or lower usually is lethal to pond fish. Bass and bluegill seldom spawn in waters below pH 5.0. Growth is slow in the pH range of 5.0 to 6.5. Growth and reproduction are satisfactory in waters between pH 6.5 and 9.0.

Two soil conditions cause excess acidity: (1) Soils deficient in calcium (lime) and (2) soils that leach acids. Sandy soils and sandstone areas are particularly deficient in calcium. Ponds in such areas should have 2 tons of agricultural limestone applied per acre. Spread it on the bottom before filling the pond with water. If you drain the pond for any reason, apply lime again at the same rate.

Excavated ponds (such as those dug for irrigation water in the Lower Coastal Plain of North and South Carolina) may become acid enough to kill fish (pH 4.0 and lower). The cause of this extreme acidity usually is the leaching of sulfuric acid from the chemical makeup of excavated soils that contain sulfides. These soils kept under water do not release sulfuric acid. The acid forms in the spoil banks and runoff water carries it into the pond. Therefore, runoff water from the excavated soil should not be allowed to drain into fishpond waters. A ditch along the rim of the pond can carry acid runoff away. To correct moderate acidity in such dug ponds, it is best to add agricultural limestone. Or you may, with care, use calcium hydroxide—known as "hydrated" or "builder's lime." Add a 50-pound bag for each surface acre each time you fertilize. Ask your soil conservationist or your county agent for the latest information on this problem.





GA–D18–40 ; MINN–1674

Waterweeds use up fertility and when they decay they use up the oxygen.

Temperature

It is not necessary to lower the temperature of water for warm-water fish even during high summer temperatures in the South. And the fish do not need shade—though the turbid water of a fertile pond provides it.

You can raise pond temperatures in the spring by removing water from the bottom, thus avoiding the constant loss of the sun-warmed surface water that would escape by conventional overflow. This is beneficial in extending the favorable growing season for the microscopic plants produced with fertilizer.

Devices that route water from the bottom of the pond through a trickle tube can be designed for any type of pond.

Oxygen

All animal life in your pond—fish, insect larvae, and worms—are using oxygen 24 hours a day, but oxygen is being replenished by surface absorption from the air and by the release of oxygen by the microscopic plants in daytime in the presence of sunlight. A pond's oxygen is always lowest at daybreak.

If oxygen becomes dangerously low, you will see fish coming to the surface and gasping for air *early in the morning.* Distress periods occur, if at all, when dying waterweeds or other organic substances are decomposing rapidly, weather is hot and still, or there have been 2 or 3 successive days of cloudy weather. When you have any of these conditions, watch your fishpond each morning between daybreak and sunrise. Fish gasping for air will indicate that unless the water is treated, many may die before the day is over or during the next night.

Another cause of oxygen deficiency in summer is high winds circulating water from the very deep parts of the pond into the top water. This is called a storm turnover. The deep water usually has little or no dissolved oxygen but has enough dissolved carbon dioxide or hydrogen sulfide and ammonia to be toxic to fish. Here again, distress signs are most likely in early morning.

To relieve shortage of oxygen, broadcast 50 to 100 pounds of superphosphate per acre over the pond surface. The superphosphate buffers the toxic effects of carbon dioxide and ammonia. It also stimulates the microscopic plants to give off more oxygen. If you treat the water soon after the fish show distress, they are usually relieved within an hour.

A bottom-water overflow device reduces the chances of a die off. If your pond overflows continuously, most of the stagnant deep water will be removed before toxic materials accumulate to killing proportions. The water taken from the pond bottom seldom causes trouble downstream since the carbon dioxide and ammonia are largely released into the air and oxygen is absorbed as the water tumbles down the vertical riser of the overflow pipe.

Insecticides

DDT, toxaphene, aldrin, chlordane, dieldrin, and other insecticides are deadly to fish even in small amounts. Keep such chemicals away from your fishpond waters. Do not rinse spray equipment or containers in the pond. Do not allow livestock sprayed or dusted with any insecticide to wade in the pond. Storm runoff from an insecticide-treated field near a pond may kill the fish. There is no treatment to stop a fish die off resulting from insecticides in the water.

Disease, fungus, parasites

Disease is rarely the primary cause of a fish die off in a well-managed pond. Sometimes dead fish do have a fungus growth upon them. This is usually the last step in Nature's way of removing weak fish. Fish of well-managed ponds are remarkably resistant to disease and parasites. At present, pond treatment for fish diseases is uncertain.

If you have a heavy die off of fish in your pond, regardless of the cause, it is usually best to kill the remaining fish and restock.

Fishing the Bass and Bluegill Pond

(Fishing of other species produced in a warm-water pond is discussed on p. 7.)

In the second year after stocking, a bass and bluegill pond will contain its maximum pounds of fish for the fertility level you have maintained and the total weight cannot be increased unless you raise the fertility. Thereafter, growth of fish is stimulated only as you harvest the crop. Take out 50 pounds of fish and 50 pounds of fish will grow back.

When to begin fishing a new pond

Your pond is ready to fish when the bass have reproduced successfully. This occurs the first spring after the bass are stocked if they mature correctly. The way to be sure of this is to catch some of the 1- or 2-inch bass in a minnow seine. If you catch no fingerling bass in the seine, you do not have a successfully stocked pond, and your pond needs restocking with bass